Hybrid Energy Resources for Virtual Sea Border Monitoring

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Abstract:**Environmental and human safety is the most important so we use renewable energy source for monitoring ships in sea border for security purposes.A common practice to combine two energy sources to power the systems is called hybrid renewable systems. Due to the long distance, and difficult access the overall system used in these applications must be reliable. This paper shows the results of using renewable hybrid systems specially used to design a monitoring system which uses RSSI to control the ships over the international borders across the seas. A unique system with monitoring aid can provide a better solution in real time. This system uses the energy from the solar photovoltaic cell and the wind turbine to power the system to make it independent ,reliable and flexible in it operation.The system communicates to the ground station through Zigbee wireless protocol.**

Keywords : Received Signal Strength Analyser,Hybrid cicuit,Embedded Controller,Ultra Capacitor,Zigbee.

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I.INTRODUCTION

As we face varied threats of terrorism and other lucrative criminal activities,at present,innovative solution shall be setup to permanently track and monitor all type of ship traffics ,in vulnerable trading lanes and zones in order to detect abnormal or illicit vessel behaviour to understand and to early identify threatening situations. This system of maritime surveillance system must follow :

- Permanent and all weather coverage of border maritime areas.
- Continous collection of the data of surveillance.
- Understanding of suspicious events and early identification of threats from series of detected vessel behaviours.

While designing a system to monitor the Sea activites,power supply to the unit is a tedious job.In considering the power supply to the system,rather than powering it from ground station its better to setup an system which is stand alone power system.

So in this paper we have proposed a system which is standalone and also an efficient sea border monitoring system.

In considering the power source to the system,we can consider the conventional fuels and alternative fuels.But while considering the conventional fuels a lot of difficulties we face they are:

- Cost of the fuel.
- Availability of the fuel.

- Frequent refilling of fuel.
- Size of the power generation system.

So due to the above drawbacks,we prefer in going to the alternative fuel,amongst the alternative fuel solar and wind are the best alternatives to replace the conventional fuels.While analysing the individual system of solar and wind ,combination of the two proved to be more efficient when compared individually.

So we use an hybrid power system along with an high efficient ultracapacitor to power the system,which we have designed for the sea border monitoring consisting of an RSSI system and Zigbee Transmission protocol.

II.EXISTING SYSTEM

Our system incorporates a mobile sea station across border which is provided by a dynamic roof of solar cell. The SWAB is used as a back up during night due to seasonal availability of solar power. The RFID is attached to help identify the ships that are crossing the borders. Wireless communication is used to communicate to the control room PC.The sources, rfid, battery and the wireless transmitters are placed on board. The wireless receiver is placed at the receiving station at the control room.
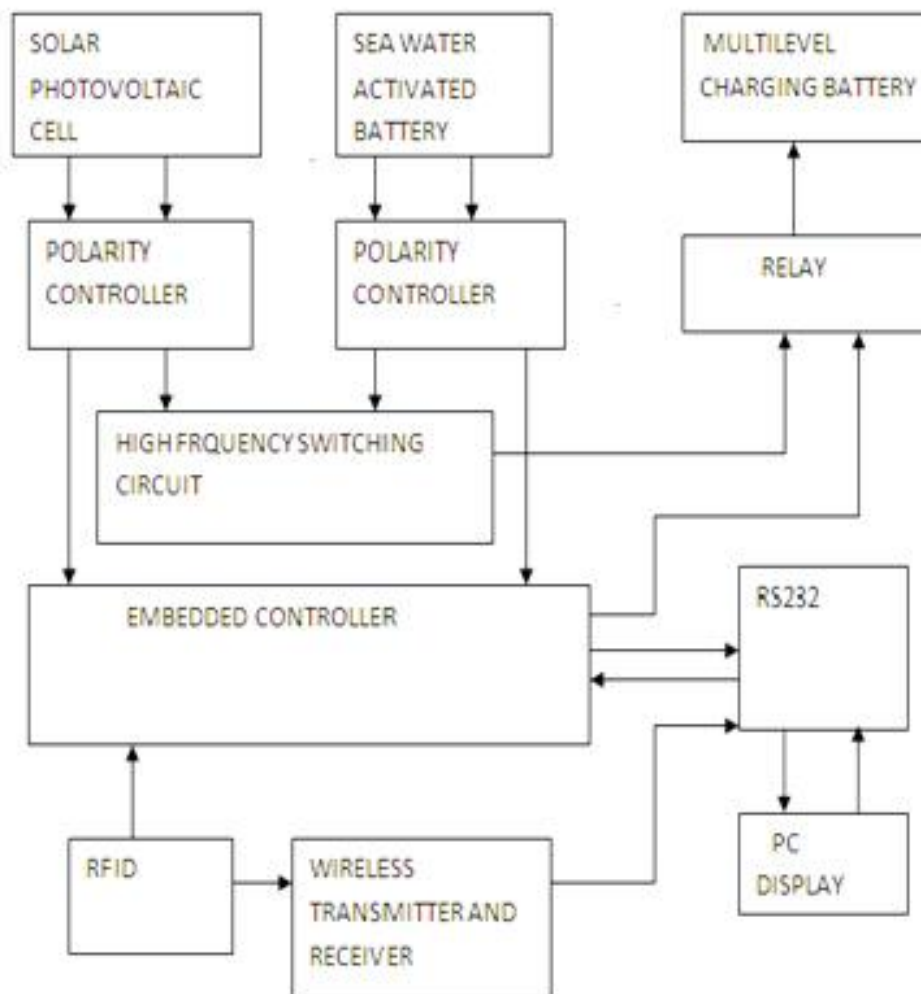

Fig 1: Sea Border Monitoring System

A.RADIO FREQUENCY IDENTIFICATION SYSTEM

The radio frequency identification(RFID) is used here to identify the ships crossing the borders and communicating to the control station. The RFID is the use of radio frequency electromagnetic fields to communicate wirelessly from the tag of the object for system identification and tracking. The RFID reader transmits and receives signals wirelessly without being in sight of the objects. The idea is that an RFID reader is used to interrogate an RFID tag to identify the objects. The tags are placed on each of the ship Thereafter mounted on the system contains an antenna that emits radio waves. The RFID tag responds to the reader over a certain distance. The RFID that we use in our project is the NSK EDK 125KHz RFID. The sensitivity of this passive tag is 6cm from the antenna. The embedded controller is programmed to identify the identity given to each ship when it crosses the international borders. This information is then transmitted and received at the control station.

B.WIRELESS TRANSMITTER AND RECEIVER

The data obtained is communicated to the control room wirelessly with the carrier frequency of 433.92MHz.The sending message frequency may be of 36KHz, 37KHz, 38KHz or 39KHz.The two frequency signals are mixed in a mixer and encoded. The encoded signal is transmitted further for processing. The receiver, at the station receives the signal, demodulates and then decodes them to communicate to the person concerned. Thus the ships are warned and informed about the threat of crossing the international borders. The RS232 is used for serial communication and to interface with the computer to view the output

C.DISADVANTAGES

- RFID system costs is High.
- The system is less reliable .
- The system performance is affected due to the external climatic condition.
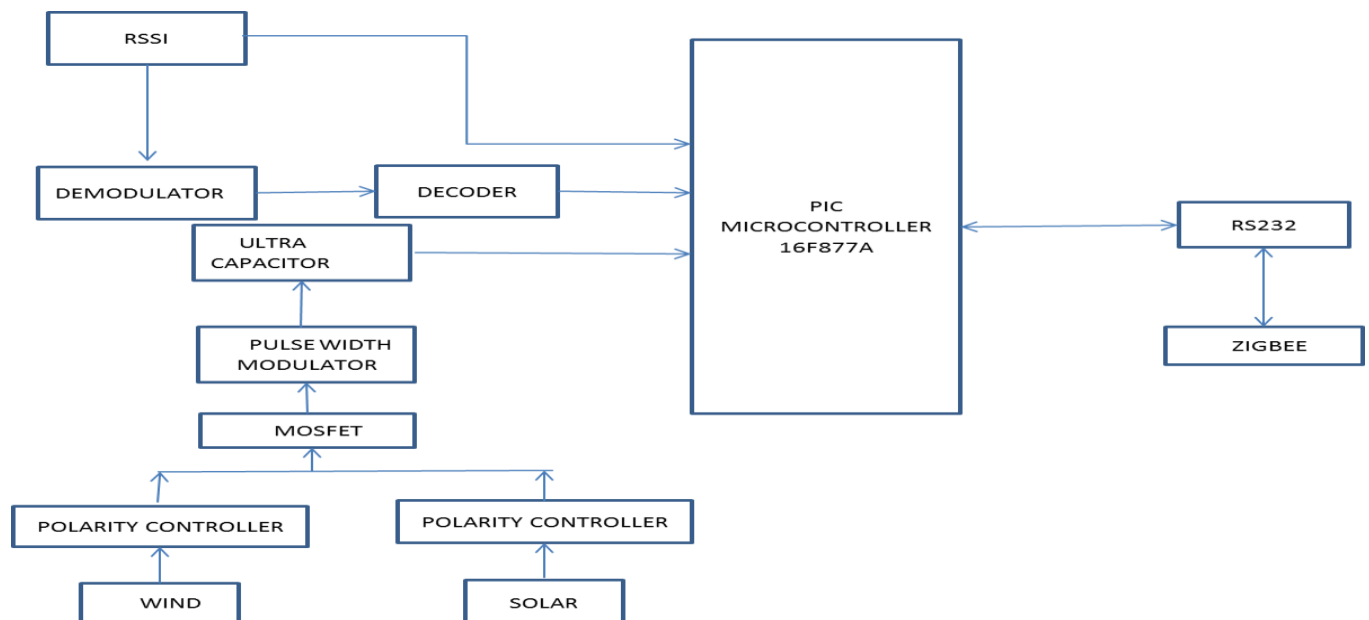
III.PROPOSED SYSTEM

Fig 2: Sea Border Monitoring System

A.SOLAR PANEL

Fig 3: Solar Panel

A high profile amorphous Silicon photovoltaic cell is employed with glass cover and fully enclosed in an aluminum body for non-corrosion. We have used 6W photovoltaic cell, whose voltages are 12V and 0.5 Amps (500 mA). The voltage may go up to 35V at peak sunlight when no load, whose full load voltage will be approximately 15V at bright sunlight.

B.WIND TURBINE
In this paper we use a turbine made up of synchronous generator which produces an output of 7w at its maximum efficiency of 10km wind speed.It produces an pure ac output for versatile usage for the system.

C.ULTRA CAPACITOR
Supercapacitors have energy densities that are approximately 10% of conventional batteries, their power density is generally 10 to 100 times greater.Double-layercapacitance – Electrostatic storage achieved by separation of charge in a Helmholtz double layer at the interface between the surface of a conductive electrode and an electrolyte. The separation of charge is of the order of a few ångströms (0.3–0.8 nm), much smaller than in a conventional capacitor. Results in much shorter charge/discharge cycles than batteries.
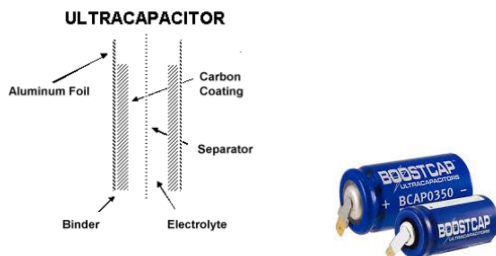

Fig 3: Ultra Capacitor

D.EMBEDDED CONTROLLER

To perform various operations and conversions required to switch, control and monitor the devices, a processor is needed. The processor may be a micro processor, microcontroller or an embedded controller .In this project, embedded controller is preferred because of its industrial advantages in power electronics like in built ADC ,RAM , ROM , PORTS USART and DAC. This results in compact and faster operation of the system. The embedded controller selected for this project is the PIC16F877A.Programming can be done with Embedded C. PIC16F877A

has five serial and parallel ports.It is a RISC(Reduced Instruction Set Computer) system following a Harvard type of architecture. Dynamic link library is not needed. All languages are understood by this processor. These features make programming of microcontroller very simple and easy.

In our project microcontroller helps in monitoring the Sea border using RSSI Technique.It also helps in the communication between the system and the ground station.

E.RECEIVED SIGNAL STRENGTH IDENTIFICATION SYSTEM

RSSI is the relative received signal strength in a wireless environment, in arbitrary units. RSSI is an indication of the power level being received by the antenna. Therefore, the higher the RSSI number, the stronger the signal.

The alert to the boat is send through the RSSI network as a voice signal to the boat .

F.ZIGBEE

ZigBee is a specification for a suite of high level communication protocols used to create personal area networks built from small, low-power digital radios. ZigBee is based on an IEEE 802.15 standard. Though low-powered, ZigBee devices can transmit data over long distances by passing data through intermediate devices to reach more distant ones, creating a mesh network; i.e., a network with no centralized control or high-power transmitter/receiver able to reach all of the networked devices. ZigBee is used in applications that require only a low data rate, long battery life, and secure networking. ZigBee networks are secured by 128 bit symmetric encryption keys.

Fig 4: Zigbee

IV.CHARGING OF ULTRACAPACITOR

The ultracapacitor is charged through a MOSFET and an pulse width modulator.MOSFET is used to avoid th reverse flowing of power from the capacitor to the turbine or solar panel because this may lead to wastage of enrgy.The Pulse Width Modulator is used to charge the capacitor in trickle mode.Trickle mode is used because it helps in faster charging of the capacitorThe output from the PWM is an Square Wave so the output is in trickle mode.

\V.STIMULATION RESULTS

The Visual Basic software is used to view the output.
Computer displays the output for the voltage and current measurements of both the PV and Wind Turbine Along with the VB design for monitoring the position of the ships and communicating the threat to the concerned person. The computer and the system interacts through Wireless Zigbee Protocol.

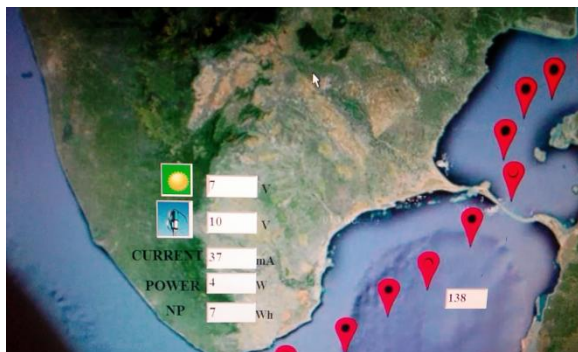Fig 5: VB Output Display without Signal Receiving

Fig 6: VB Output Display Signal Receiving

VI.RESULTS AND DISCUSSIONS

The system has been implemented as a prototype and has been tested successfully..The sources,RSSI and the wireless module are placed on the inflation system that is placed at the borders.The consumes around 1W maximum at its maximum working load .The wireless module receives an alert signal when it comes very close to the sea border.

VII.CONCLUSION

Thus the above proposed system provides solution to the global issue of vulnerability of ships due to piracy across international borders over the oceans and hence ensuring the security of the working men.The system involves the use cost effective, faster and reliable equipments thus making it easier, smootherand user friendly to operate. This system can be extended over the real time in wider scopes to provide lot more solutions to security issues over the seas. Thus the system assures an environmentally safe and clean implementation to resolve the issue of global concern.

VIII.REFERENCE

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